EPA VALIDATION OF CIBA RESULTS DIOXINS

received 28 MAY 92 AL

9109022-0A

DATA VALIDATION COVER SHEET

1. **Site Name:** CIBAGEIGY

2. **Case/SAS#:** 6684A

3. **SDG#:** 6684A-1

4. **Data Validation Subcontractor:** (if applicable) N/A

5. **Data Reviewer:** J BARTELS

6. **Resubmission(s) Description/ Explanation:** ① sample calculation of EMPC, EDL and concentration ② corrected TEF comms ③ clarify the identity of EPA #6684A-6 ④ Form I PCDD-3 for #12910 ⑤ Autospec. Instrument log notes ⑥ original coc (pink)

7. **Date(s) Resubmission(s) Requested:** Jan 23 and Jun 28

8. **Date(s) Resubmission(s) Received:** 2/3/92

9. **Unresolved Item(s):** N/A

10. **Prime Contractor:** LOCKHEED (ESAT)

Signature: J M Bl

Date: 4/28/92

Lockheed
Engineering & Sciences Company

Environmental Services Assistance Teams
Region 1

19 Crosby Drive
Bedford, Massachusetts 01730

Ms. Margaret Leshen
Regional Sample Control Custodian
U.S. Environmental Protection Agency
90 Canal Street
Boston, Massachusetts 02114

February 6, 1992
Revised 4/8/92
B-92-04-Y

DO # 9109022-0A

Re: TID No. 01-92-01-15
SAS No. 6684A, SDG No. 6684A-1
Keystone / NEA Environmental Resources
CIBA GEIGY Cranston, RI.

Dioxin:/4/Aqueous/6684A-3,6684A-4,6684A-5,6684A-6
PEM/2/Soil/6684A-1,6684A-2

Dear Ms. Leshen:

A validation was performed on the dioxin/furan analytical data for 4 aqueous samples and 2 PEM samples collected at the Ciba-Geigy site in Cranston, RI. The samples were analyzed according to SAS 6684A Specifications. The data were evaluated based on the following parameters:

- Data Completeness
- * PEM Samples
- Window Defining Mix
- * Calibration
- * Column Performance
- * Internal Standards
- * Recovery Standards
- Method Blanks
- Duplicate Samples
- Matrix Spike/Matrix Spike Duplicates
- * Concentration/EMPC/EDL
- * Total Congener Concentrations
- Toxic Equivalent Factors

* All criteria were met for this parameter

Table 1 summarizes the validation recommendations which were based on the following information:

February 6, 1992
Revised 4/8/92
B-92-04-Y

Please contact Janine Bartels at the Lockheed ESAT office at (617) 275-7868 should you have any questions or comments regarding the information.

Very truly yours,

LOCKHEED ENGINEERING
& SCIENCES COMPANY

Janine Bartels
Senior Scientist

Jack Berges
ESAT Team Manager

/jba
Enclosures
cc: Steve Stodola

Faraday

ATTACHMENT I

DIOXIN DATA REVIEW WORKSHEET

Regional Review of Dioxin Data Package

The hard copied (laboratory name Keystone/NEA data package received at Region I has been reviewed and the quality assurance and performance data summarized. The data review included:

Case No. 6684A
Sampling Date 9/11/91
Matrix Water
Date Received by Laboratory Sept 12 1991

SAS No. 6684A
No. of Samples 12
Shipping Date 9/11/91

Sample Nos.:

PEM Nos.	Laboratory ID	EPA Identification No.
Fortified Std	91145125P02-02	WEE656 / 6684A-2
Fortified Blank	91145125P02-01	083D4I / 6684A-1

The general criteria used to determine the performance were based on an examination of:

- o PEM Samples
- o Initial and continuing calibrations
- o Retention time marker solutions
- o Estimated maximum possible concentration
- o Internal Standard response
- o Recovery standard areas
- o Matrix spike analysis
- o Duplicate analysis
- o Method blanks
- o Instrument sensitivity check
- o Chromatographic resolution

Definition of Qualifiers

A - Acceptable data
J - Approximate data due to quality control criteria
R - Reject data due to quality control criteria
U - Not detected
S - $[M-COCl]^+$ ion did not meet S/N ratio >2.5 requirement
H - Did not meet the ion abundance criteria

Data Completeness

The laboratory was contacted on January 23, 1992 and on January 28, 1992 for the following information: sample calculations of the estimated detection limits (EDL); sample calculations of the estimated maximum possible concentration (EMPC); and sample calculations of the concentration for sample 6684A-2; confirmation of TEF values for 2,3,4,7,8-PeCDF and the adjusted concentrations; clarify the identity of EPA 6684A-6 (tag#12913 and tag#12914) which did not match Keystone ID# listed in the SDG narrative; corrected PCDD forms for sample 6684A-6; form 1 PCDD-3 for sample 6684A-5/12910; autospec 1 instrument log notes for 10/19/91, pages 31 and 32; and an explanation of what happened to the original pink chain of custody forms. Information was received from the laboratory on February 4, 1992. Phone logs and correspondence are enclosed.

PEM Samples

No 2,3,7,8-TCDD was reported in the blank PEM sample 6684A-1 (083D4I). In the spike PEM sample 6684A-2 (WEE656), 1.8 ppb of 2,3,7,8-TCDD was reported which is within the 99% prediction limit.

Window Defining Mix

The analyte 2,3,7,8-TCDF shifted outside of the required retention time windows for sample 6684A-3. Since the analyte did not meet rentention time criteria for the 2,3,7,8-TCDF analyte, estimate (J) positive values for 2,3,7,8-TCDF for sample 6684A-3.

Internal and Recovery Standards

The laboratory spiked the sample extract with 200 pg of 37C-2,3,7,8-TCDD immediately prior to the clean-up procedure, rather than 800 pg as required in EPA method 1613. This was to reduce contamination in the m/z=322 channel. No action was required. All other criteria for internal and recovery standards were met.

Blanks

DFBLK1 was lost during the evaporation process because the flask cracked. Estimate (J) positive results for sample 6684A-3 associated with this blank.

DFBLK2 showed low level of OCDD/OCDF. Estimate (J) positive for OCDD/OCDF for all samples due to low level OCDD/OCDF contamination throughout this SDG.

DFBLK4 was contaminated by the laboratory during the sample preparation process. Estimate (J) positive results for all analytes for sample 6684A-6 associated with this blank.

Duplicate Samples

Samples 6684A-3 and 6684A-3D showed %RPD values outside the 50-150% range for 1,2,3,6,7,8-HxCDF, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD and 1,2,3,7,8,9-HxCDD. Estimate (J) positive results and (UJ) non-detects. Samples 6684A-5 and 6684A-5D showed %RPD values outside the 50-150% range for 2,3,4,6,7,8-HxCDF and 1,2,3,4,7,8,9-HpCDF. Estimate (J) positive results and (UJ) non-detects.

Sample 6684A-6: The data in the original sample packet was labeled #91US12SP02-11. The sample was actually the duplicate of that sample #91US12SP02-12. The first sample #91US12SP02-11 was contaminated during extraction. No duplicate sample was run. No action was necessary.

Matrix Spike and Matrix Spike Duplicate

Recoveries for 2,3,4,7,8-PeCDF (165%) and OCDF (46%) were outside the 60-140% limits in sample 6684A-3S. Estimate (J) positive values and (UJ) non-detects for OCDF and 2,3,4,7,8-PeCDF for the unspiked 6684A-3 samples.

Concentration / EMPC / EDL

Estimated (J) values will be reported as EMPC for parameters which have blank contamination, retention time window shifts, % RPD outside limits and % recoveries outside limits.

Toxic Equivalent Factors

Toxic Equivalent Factors used to calculate TEF adjusted concentrations are from "Interim Procedures for Estimating Risk Associated with Exposure to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans (CDDs and CDFs)" EPA 625-3-89-016, March 1989. The laboratory used a multiplying factor of 0.05 for 2,3,4,7,8-PeCDF. The multiplying factor should have been 0.5. The laboratory resubmitted corrected TEFs as requested.

Data Package Summary

The overall quality of the dioxin data package was acceptable. The DC-2 forms and page numbering were not included in the original package. The laboratory submitted DC-2 forms with no page numbers. No other problems were encountered with this case.

Data Summary Key

A - Acceptable data.

J - The associated numerical value is an estimated quantity.

R - Reject data due to quality control criteria. The data are unusable (compound may or may not be present). Resampling and reanalysis is necessary for verification.

U - The compound was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.

UJ - The compound was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.

-- - The compound was analyzed for, but was not detected. The sample quantitation limit is the same as the CRQL presented.

SITE: Ciba - Geigy - Cranston, RI

CASE/SAS NO: 6684A / 6684A-1

Sample No	6684A-1/12902		6684A-2/12901		6684A-3/12903	
Matrix	Soil		Soil		Water	
TCDD/TCDF Conc	pg/g	DL/EMPC*	pg/g	DL/EMPC*	pg/L	DL/EMPC*
2,3,7,8-TCDD	U	0.45	1800		UJ	5.2
1,2,3,7,8-PeCDD	U	0.72	U	0.65	9.0 J	
1,2,3,4,7,8-HxCDD	U	3.1	U	12	UJ	1.2
1,2,3,6,7,8-HxCDD	U	2.1	U	8.0	UJ	9.0
1,2,3,7,8,9-HxCDD	U	1.3	U	3.9	UJ	3.0
1,2,3,4,6,7,8-HpCDD	100		100		56 J	
OCDD	140 J		3600 J		630 J	
2,3,7,8-TCDF	U	0.41	U	0.43	240 J	
1,2,3,7,8-PeCDF	U	1.9	U	0.80	4.8 J	
2,3,4,7,8-PeCDF	U	1.1	U	0.72	46 J	
1,2,3,4,7,8-HxCDF	U	1.1	U	5.2	24 J	
1,2,3,6,7,8-HxCDF	U	1.1	U	5.1	7.1 J	
2,3,4,6,7,8-HxCDF	U	2.5	U		7.3 J	
1,2,3,7,8,9-HxCDF	U	1.2	U	7.0	UJ	1.6
1,2,3,4,6,7,8-HpCDF	U	950	U	2700	UJ	32
1,2,3,4,7,8,9-HpCDF	U	27	U	5.9	UJ	7.0
OCDF	58 J		150 J		39 J	
TOTAL TCDD	U	0.45	3600		120 J	
TOTAL PeCDD	U	0.72	U	0.65	9.0 J	
TOTAL HxCDD	U	1.3	U	3.9	7.7 J	
TOTAL HpCDD	190		150		110 J	
TOTAL TCDF	U	0.41	1.8		47000 J	
TOTAL PeCDF	U	1.1	U	0.72	200 J	
TOTAL HxCDF	U	1.1	U	5.2	79 J	
TOTAL HpCDF	2700		2400		19 J	
TOXICITY EQUIVALENCY	1.2 pg/g J		1800 pg/g J		53 pg/L J	
DILUTION FACTOR	1.0		1.0		1.0	
DATE OF RECEIPT	9/12/91		9/12/91		9/12/91	
SAMPLE EXTRACTION DATE	10/10/91		10/10/91		10/5/91	
ANALYSIS DATE	10/18/91		10/19/91		10/14/91	
GC/MS I.D.UG-TRIO-1	18OCT91LCB6051		18OCT91LCB6061		14OCT91LCB5051	

SITE: Ciba Geigy - Cranston, RI

CASE/SAS NO: 6684A / 6684A-1

Sample No	6684A-3D/12904		6684A-4/12907		6684A-4D/12908	
Matrix	Water		Water		Water	
TCDD/TCDF Conc	pg/L	DL/EMPC*	pg/L	DL/EMPC*	pg/L	DL/EMPC*
2,3,7,8-TCDD	UJ	4.3	U	2.1	U	2.8
1,2,3,7,8-PeCDD	6.9 J		U	2.7	U	2.7
1,2,3,4,7,8-HxCDD	UJ	2.7	U	3.1	U	3.0
1,2,3,6,7,8-HxCDD	UJ	5.3	U	2.3	U	2.4
1,2,3,7,8,9-HxCDD	UJ	4.2	U	2.6	U	2.7
1,2,3,4,6,7,8-HpCDD	45 J		U	3.8	3.5	
OCDD	470 J		84 J		81 J	
2,3,7,8-TCDF	210 J		U	1.4	U	2.7
1,2,3,7,8-PeCDF	4.7 J		U	2.1	U	2.5
2,3,4,7,8-PeCDF	38 J		U	1.7	U	2.2
1,2,3,4,7,8-HxCDF	UJ	20	U	1.4	U	1.7
1,2,3,6,7,8-HxCDF	UJ	15	U	1.3	U	1.6
2,3,4,6,7,8-HxCDF	UJ	5.6	U	3.5	U	4.9
1,2,3,7,8,9-HxCDF	UJ	1.1	U	3.9	U	2.2
1,2,3,4,6,7,8-HpCDF	UJ	38	U	7.9	U	13
1,2,3,4,7,8,9-HpCDF	UJ	5.1	U	1.9	U	1.4
OCDF	22 J		U	3.0	10 J	
TOTAL TCDD	120 J		U	2.1	U	2.8
TOTAL PeCDD	26 J		U	2.7	U	2.7
TOTAL HxCDD	15 J		U	2.3	U	2.4
TOTAL HpCDD	89 J		U	1.4	6.0	
TOTAL TCDF	43000 J		U	1.4	27	
TOTAL PeCDF	180 J		U	1.7	U	2.2
TOTAL HxCDF	27 J		U	1.3	U	1.6
TOTAL HpCDF	14 J		U	1.9	U	1.4
TOXICITY EQUIVALENCY	49 pg/L J		0.084 pg/L J		0.13 pg/L J	
DILUTION FACTOR	1.0		1.0		1.0	
DATE OF RECEIPT	9/12/91		9/12/91		9/12/91	
SAMPLE EXTRACTION DATE	10/5/91		10/7/91		10/7/91	
ANALYSIS DATE	10/14/91		10/15/91		10/15/91	
GC/MS I.D.UG-TRIO-1	14OCT91LCB5061		14OCT91LCB5131		14OCT91LCB5141	

SITE: Ciba Geigy - Cranston, RI

CASE/SAS NO: 6684A / 6684A-1

Sample No	6684A-5/12910		6684A-5D/12912		6684A-6/12914	
Matrix	Water		Water		Water	
TCDD/TCDF Conc	pg/L	DL/EMPC*	pg/L	DL/EMPC*	pg/L	DL/EMPC*
2,3,7,8-TCDD	U	3.2	U	2.1	UJ	1.7
1,2,3,7,8-PeCDD	U	3.6	U	2.1	UJ	2.6
1,2,3,4,7,8-HxCDD	U	4.5	U	2.6	UJ	10
1,2,3,6,7,8-HxCDD	U	3.6	U	2.0	UJ	9.2
1,2,3,7,8,9-HxCDD	U	4.1	U	2.2	UJ	9.5
1,2,3,4,6,7,8-HpCDD	26		21		42 J	
OCDD	350 J		320 J		200 J	
2,3,7,8-TCDF	U	3.4	U	1.5	23 J	
1,2,3,7,8-PeCDF	U	2.5	U	2.1	21 J	
2,3,4,7,8-PeCDF	U	2.2	U	1.9	15 J	
1,2,3,4,7,8-HxCDF	U	2.4	U	1.1	66 J	
1,2,3,6,7,8-HxCDF	U	2.3	U	1.1	21 J	
2,3,4,6,7,8-HxCDF	U	3.0	UJ	4.1	UJ	45
1,2,3,7,8,9-HxCDF	U	3.3	U	1.4	UJ	3.9
1,2,3,4,6,7,8-HpCDF	U	11	U	12	100 J	
1,2,3,4,7,8,9-HpCDF	UJ	2.7	UJ	2.2	28 J	
OCDF	UJ	18	17 J		190 J	
TOTAL TCDD		3.2		2.1	UJ	1.7
TOTAL PeCDD		3.6		2.1	14 J	
TOTAL HxCDD		4.1		2.0	22 J	
TOTAL HpCDD	46		17		74 J	
TOTAL TCDF	6.5			1.5	94 J	
TOTAL PeCDF		2.2		1.9	130 J	
TOTAL HxCDF	UJ	2.3	UJ	1.1	150 J	
TOTAL HpCDF		2.7	7.6		200 J	
TOXICITY EQUIVALENCY	0.61 pg/L J		0.55 pg/L J		22 pg/L J	
DILUTION FACTOR	1.0		1.0		1.0	
DATE OF RECEIPT	9/12/91		9/12/91		9/12/91	
SAMPLE EXTRACTION DATE	10/7/91		10/7/91		10/22/91	
ANALYSIS DATE	10/15/91		10/15/91		10/24/91	
GC/MS I.D.UG-TRIO-1	14OCT91LCB5111		14OCT91LCB5121		24OCT91LCB2021	

CIBA GEIGY
CASE/SAS: 6684A-1
TABLE I
RECOMMENDATIONS SUMMARY

SAMPLE NUMBER:	6684A-1/12902	6684A-2/12901	6684A-3/12903	6684A-3D/12904
DIOXINS				
2,3,7,8-TCDD	A	A	J^2	J^2
1,2,3,7,8-PeCDD	A	A	J^2	J^2
1,2,3,4,7,8-HxCDD	A	A	J^2 J^4	J^4
1,2,3,6,7,8-HxCDD	A	A	J^2 J^4	J^2 J^4
1,2,3,7,8,9-HxCDD	A	A	J^2 J^4	J^4
1,2,3,4,6,7,8-HpCDD	A	A	J^2	J^2
OCDD	J^3	J^3	J^2 J^3	J^2 J^3
FURANS				
2,3,7,8-TCDF	A	A	J^1 J^2	J^1 J^2
1,2,3,7,8-PeCDF	A	A	J^2	J^2
2,3,4,7,8-PeCDF	A	A	J^2 J^6	J^6
1,2,3,4,7,8-HxCDF	A	A	J^2	J^2
1,2,3,6,7,8-HxCDF	A	A	J^2 J^4	J^2 J^4
2,3,4,6,7,8-HxCDF	A	A	J^2	J^2
1,2,3,7,8,9-HxCDF	A	A	J^2	J^2
1,2,3,4,6,7,8-HpCDF	A	A	J^2	J^2
1,2,3,4,7,8,9-HpCDF	A	A	J^2	J^2
OCDF	J^3	J^3	J^6 J^3 J^2	J^6 J^3

CIBA GEIGY
CASE/SAS: 6684A-1
TABLE I CONT.
RECOMMENDATIONS SUMMARY

SAMPLE NUMBER:	6684A-4/12907	6684A-4D/12908	6684A-5/12910	6684A-5/12912
DIOXINS				
2,3,7,8-TCDD	A	A	A	A
1,2,3,7,8-PeCDD	A	A	A	A
1,2,3,4,7,8-HxCDD	A	A	A	A
1,2,3,6,7,8-HxCDD	A	A	A	A
1,2,3,7,8,9-HxCDD	A	A	A	A
1,2,3,4,6,7,8-HpCDD	A	A	A	A
OCDD	J[3]	J[3]	J[3]	J[3]
FURANS				
2,3,7,8-TCDF	A	A	A	A
1,2,3,7,8-PeCDF	A	A	A	A
2,3,4,7,8-PeCDF	A	A	A	A
1,2,3,4,7,8-HxCDF	A	A	A	A
1,2,3,6,7,8-HxCDF	A	A	A	A
2,3,4,6,7,8-HxCDF	A	A	J[5]	J[5]
1,2,3,7,8,9-HxCDF	A	A	A	A
1,2,3,4,6,7,8-HpCDF	A	A	A	A
1,2,3,4,7,8,9-HpCDF	A	A	J[5]	J[5]
OCDF	J[3]	J[3]	J[3]	J[3]

CIBA GEIGY
CASE/SAS: 6684A-1
TABLE I CONT.
RECOMMENDATIONS SUMMARY

SAMPLE NUMBER: 6684A-6/12914

DIOXINS

2,3,7,8-TCDD	J^2
1,2,3,7,8-PeCDD	J^2
1,2,3,4,7,8-HxCDD	J^2
1,2,3,6,7,8-HxCDD	J^2
1,2,3,7,8,9-HxCDD	J^2
1,2,3,4,6,7,8-HpCDD	J^2
OCDD	J^2 J^3

FURANS

2,3,7,8-TCDF	J^2
1,2,3,7,8-PeCDF	J^2
2,3,4,7,8-PeCDF	J^2
1,2,3,4,7,8-HxCDF	J^2
1,2,3,6,7,8-HxCDF	J^2
2,3,4,6,7,8-HxCDF	J^2
1,2,3,7,8,9-HxCDF	J^2
1,2,3,4,6,7,8-HpCDF	J^2
1,2,3,4,7,8,9-HpCDF	J^2
OCDF	J^2 J^3

SUMMARY KEY

A - Accept the data

J[1] - Estimate (J) positive values and (UJ) non-detects for 2,3,7,8-TCDF for sample 6684A-3. 2,3,7,8-TCDF was not resolved from its 13C-2,3,7,8-TCDF analog.

J[2] - Estimate (J) positive values and (UJ) non-detected values for all analytes associated with 6684A-3 and 6684A-6. The blank was contaminated during preparation.

J[3] - Estimate (J) positive values for OCDD/OCDF due to low level contamination found in the blank for all samples.

J[4] - Estimate (J) positive values and (UJ) non-detects for 1,2,3,6,7,8-HxCDF, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD and 1,2,3,7,8,9-HxCDD for sample 6684A-3. The % RPD was outside the 50-150% range.

J[5] - Estimate (J) positive values and (UJ) non-detects for 2,3,4,6,7,8-HxCDF and 1,2,3,4,7,8,9-HpCDF for sample 6684A-5. The % RPD was outside the 50-150% range.

J[6] - Estimate (J) positive values for OCDF and 2,3,4,7,8-PeCDF due to % recoveries outside the control limits for the unspiked 6684A-3 samples.

DIOXIN DATA REVIEW WORKSHEET

I PEM SAMPLES

A. Fortified Blank	Laboratory ID	EPA ID	Laboratory No.
08304I	12902	6684A-1	91451255P02-01
Compounds Found	**Concentration**	**Expected Concentration**	
*1	pg/L	NA	
1234678 HpCDD	100	NA	
OCDD	140	NA	
OCDF	58	NA	

B. Fortified Std.	Laboratory ID	EPA ID	Laboratory No.
WEF656	12901	6684A-2	91451255P02-02
Compounds Found	**Concentration**	**EPA 95% Prediction Level**	
*2 2,3,7,8-TCDD	1.8	1.8	

reported value within the 99% prediction limit.

Action: If the 2,3,7,8-TCDD reported in the fortified standard is beyond the 95% prediction level or a false positive for 2,3,7,8-TCDD in the blank is reported, reject all data.

*1 Interfering PeCDD/PeCDF, HxCDD/HxCDF, HpCDD/HpCDF and OCDD/OCDF were detected in the Blank sample but not at quantitation level which would affect the analysis.

*2 Interfering HeCDD/HxCDF, HpCDD/HxCDF and OCDD/OCDF were detected which did not effect the native analytes.

No Action

II. INITIAL AND CONTINUING CALIBRATION

Date of Initial Calibration: Oct 9 1991

Date of Continuing Calibration: Oct 9 1991, Oct 14, Oct 18, Oct 24, 1991

Date	Instrument	% RSD, %D	Compound (Results)	Samples Affected

Action: % RSD >15% approximate all the associated data (J or UJ)
% D >30% approximate all the associated data.

Was a CC3 analyzed just prior to sample analysis and every 12 hours ?

yes

All criteria

III. WINDOW DEFINING MARKER WDM 1

Was a window defining marker solution analyzed with the case?

	First Isomer	Last Isomer
TCDD	23:62	29:62
PeCDD	33:39	38:92
HxCDD	42:63	46:20
HpCDD	50:77	52:15
TCDF	22:03	29:60
PeCDF	30:17	39:17
HxCDF	41.35	46:85
HpCDF	50:13	52:85

Were the PCDD/PCDF isomers reported within the defined windows?

NO

Actions: If any of the PCDD/PCDF congeners were outside the retention window make sure that new descriptors are used.

~~All criteria met~~

6684A-3 samples

2,3,7,8 - TCDF Std all and 4

III. WINDOW DEFINING MARKER WDM2

Was a window defining marker solution analyzed with the case?

	First Isomer	Last Isomer
TCDD	23:55	29:52
PeCDD	33:36	38:87
HxCDD	42:58	46:15
HpCDD	50:73	52:13
TCDF	21:98	29:53
PeCDF	30:10	34:12
HxCDF	41:30	46:80
HpCDF	50:10	52:82

Were the PCDD/PCDF isomers reported within the defined windows?

NO

Actions: If any of the PCDD/PCDF congeners were outside the retention window make sure that new descriptors are used.

All criteria met.

III. WINDOW DEFINING MARKER WDM3

Was a window defining marker solution analyzed with the case?

	First Isomer	Last Isomer
TCDD	26:33	33:15
PeCDD	36:6.5	41:17
HxCDD	45:25	48:67
HpCDD	53:08	54:43
TCDF	24:55	33:15
PeCDF	33:75	42:02
HxCDF	44:03	49:32
HpCDF	52:60	55:15

Were the PCDD/PCDF isomers reported within the defined windows?

yes

Actions: If any of the PCDD/PCDF congeners were outside the retention window make sure that new descriptors are used.

All criteria ~~critics~~ met

IV. COLUMN PERFORMANCE RESOLUTION CHECK

Was the chromatographic resolution of ^{13}C-TCDDs and HxCDDs in the CC3 solution for DB-5 columns calculated for each 12 hour period? yes

% Valley ^{13}C-2378-TCDD/^{13}C-1234-TCDD 5, 9, 0% (QC limit ≤25%)

% Valley between HxCDDs 32, 48, 49 (QC limit ≤50%)

For SP-2331 columns: ~~not done~~. N A.

% Valley 1478-TCDD/2378-TCDD_____ (QC limit ≤25%)

% Valley 2378-TCDD/(1237/1238)-TCDD_____ (QC limit ≤25%)

Actions: If the peak resolution is >25 %, the reviewer must use his/her professional judgement on the severity of the problem and its effect on the final results.

all criteria met.

V. METHOD BLANKS DFBLK01

Was a method blank prepared and analyzed for each matrix prior to analysis of samples?

Yes [✓] No [ ]

Blank ID	Compound	<2% IS Signal	>2% IS Signal

Action: If a method blank associated with a sample group is contaminated, the associated positive samples and any sample containing any peaks that do not meet all identification criteria must be reextracted and reanalyzed.

low Recoveries of Fs - extract 5 and 4S for samples 12903, 12904, 12905, 12906, - Sample was corrupted.

V. METHOD BLANKS DFB1K2

Was a method blank prepared and analyzed for each matrix prior to analysis of samples?

Yes [✓] No [ ]

Blank ID	Compound	<2% IS Signal	>2% IS Signal
	OCDD		✓

Action: If a method blank associated with a sample group is contaminated, the associated positive samples and any sample containing any peaks that do not meet all identification criteria must be reextracted and reanalyzed.

All criteria met.

low Level OCDD/OCDF found at J+ and us for OCDD

for samples. 6684A-5:12910, 6684A-6:12912

6684A-4:12907, and 6684A-4:12908

V. METHOD BLANKS DFBLK4

Was a method blank prepared and analyzed for each matrix prior to analysis of samples?

Yes [ ] No [ ]

Blank ID	Compound	<2% IS Signal	>2% IS Signal
	~~2378 TCDF~~	✓	
	12378 PeCDF	✓	
	~~23478 PeCDF~~	✓	
	~~123478 HxCDF~~		✓
	123678-HxCDF	✓	
	~~123678 HxCDD~~	✓	
	~~123789 HxCDD~~	✓	
	TCDF	✓	
	PeCDF	✓	
	PeCDD	✓	
	HxCDF		✓
	HxCDD		✓
	OCDD		✓
	OCDF		✓

Action: If a method blank associated with a sample group is contaminated, the associated positive samples and any sample containing any peaks that do not meet all identification criteria must be reextracted and reanalyzed.

BLK contaminated during sample prep.

estimate J+ and UJ for samples.

(6688A-6)

V. METHOD BLANKS DFB1K3

Was a method blank prepared and analyzed for each matrix prior to analysis of samples?

Yes [✓] No [ ]

Blank ID	Compound	<2% IS Signal	>2% IS Signal

Action: If a method blank associated with a sample group is contaminated, the associated positive samples and any sample containing any peaks that do not meet all identification criteria must be reextracted and reanalyzed.

All criteria met.

VI. MATRIX SPIKE 6684A-35/12906/12905

List percent recovery which did not meet the limits criteria.

Compound	MS % Recovery	Limits
TCDD	~~0 = DF~~	60-140
PeCDD	✓ 154 165	60-140
HxCDD		60-140
HpCDD		60-140
OCDD		60-140
TCDF		60-140
PeCDF		60-140
HxCDF		60-140
HpCDF		60-140
OCDF	46 % 12905	60-140

Actions: Recheck calculations

NO Action.

VI. MATRIX SPIKE 6684-35 12905

List percent recovery which did not meet the limits criteria.

Compound	MS % Recovery	Limits
TCDD		60-140
PeCDD		60-140
HxCDD		60-140
HpCDD		60-140
OCDD		60-140
TCDF		60-140
PeCDF	165	60-140
HxCDF		60-140
HpCDF		60-140
OCDF	36	60-140

Actions: Recheck calculations

no Action

J+ and UJ Analytes.

VI. MATRIX SPIKE 6684A-35:12906

List percent recovery which did not meet the limits criteria.

Compound	MS % Recovery	Limits
TCDD		60-140
PeCDD		60-140
HxCDD		60-140
HpCDD		60-140
OCDD		60-140
TCDF		60-140
PeCDF	154	60-140
HxCDF		60-140
HpCDF		60-140
OCDF		60-140

Actions: Recheck calculations

NO Action

VII. DUPLICATE

Was a duplicate run for each matrix?

Yes [✓] No [ ]

The RPD of each analyte detected must be within 50-150% range.

Actions: Recheck all calculations if beyond the specified range. Professional judgement should be used to ascertain effect on final data.

6684A-3

~~123678 HxCDF -71~~

123478 HxCPD -200

~~123678 HxCDD -52~~

123789 HxCPD -200

6684A-4

OCDF 108

6684AF5

234678 HxCDF -200

1234789 HpCDF -200

6684A-L sample lost.

ext J+ for coelutions and u non detects.

VIII. RECOVERY STANDARD RESPONSE

	CC-3 Standard ID:	Column:
	^{13}C-1,2,3,4-TCDD	^{13}C-1,2,3,7,8,9-HxCDD
Area Counts		
Upper Limit		
Lower Limit		

List samples which did not meet criteria.

	CC-3 Standard ID:	Column:
	^{13}C-1,2,3,4-TCDD	^{13}C-1,2,3,7,8,9-HxCDD
Area Counts		
Upper Limit		
Lower Limit		

List samples which did not meet criteria.

	CC-3 Standard ID:	Column:
	^{13}C-1,2,3,4-TCDD	^{13}C-1,2,3,7,8,9-HxCDD
Area Counts		
Upper Limit		
Lower Limit		

List samples which did not meet criteria.

All criteria met.

DIOXIN DATA REVIEW WORKSHEET

I PEM SAMPLES

A.

Fortified Blank	Laboratory ID	EPA ID	Laboratory No.
Compounds Found	Concentration	Expected Concentration	
Lost during extraction.			

B.

Fortified Std. WEF656	Laboratory ID 12901	EPA ID 16684A-2	Laboratory No. 91451252202-02
Compounds Found	Concentration	EPA 95% Prediction Level	
2,3,7,8-TCDD	1.6 pg/g	100%	
1234678 HpCDD	0.1 pg/g		
OCDD	3.6 pg/g		
OCDF	0.15 pg/g		

Action: If the 2,3,7,8-TCDD reported in the fortified standard is beyond the 95% prediction level or a false positive for 2,3,7,8-TCDD in the blank is reported, reject all data.

Interferences from HxCDD/HxCDF (Hexas), HpCDD/HpCDF (HpTa) and OCDD/OCDF channel which do not affect quantitation of native analytes

NO Action

X. TOXIC EQUIVALENT FACTOR (TEF) 6684A-2 : 12901

Were samples with a TEF > 0.7ug/Kg for soil/sediment or fly ash; 7.0ug/Kg for chemical waste and 0.007ug/L for aqueous samples confirmed on SP-2300, SP-2331 or equivalent column?

Were EMPC values were included in the TEF calculations?

Yes [ ] No [ ]

Check that the TEF values were calculated including EMPCs using the following guidelines:

Compound	Multiplying Factor	Concentration	Toxic Equivalent
2,3,7,8-TCDD	1.00	1800	1800
Other TCDD	0.00		
2,3,7,8-PeCDD	0.50		
Other PeCDD	0.00		
2,3,7,8-HxCDDs	0.10		
Other HxCDD	0.00		
2,3,7,8-HpCDD	0.01	100	1.0
Other HpCDD	0.00		
OCDD	0.001	3600	3.6
2,3,7,8-TCDF	0.100		
Other TCDF	0.000		
1,2,3,7,8-PeCDF	0.050		
2,3,4,7,8-PeCDF	0.500		
Other PeCDF	0.000		
2,3,7,8-HxCDF	0.100		
Other HxCDF	0.000		
2,3,7,8-HpCDF	0.010		
Other HpCDF	0.000		
OCDF	0.001	150	.15
	Total Toxic Equivalent		1800

Reference: "Interim Procedure for Estimating Risk Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans (CDDs and CDFs)" EPA/625/3-89/016.

X. TOXIC EQUIVALENT FACTOR (TEF) 6684A-1 ; 12902

Were samples with a TEF > 0.7ug/Kg for soil/sediment or fly ash; 7.0ug/Kg for chemical waste and 0.007ug/L for aqueous samples confirmed on SP-2300, SP-2331 or equivalent column?

Were EMPC values were included in the TEF calculations?

Yes [✓] No [ ]

Check that the TEF values were calculated including EMPCs using the following guidelines:

Compound	Multiplying Factor	Concentration	Toxic Equivalent
2,3,7,8-TCDD	1.00		
Other TCDD	0.00		
2,3,7,8-PeCDD	0.50		
Other PeCDD	0.00		
2,3,7,8-HxCDDs	0.10		
Other HxCDD	0.00		
2,3,7,8-HpCDD	0.01	100	1.0
Other HpCDD	0.00	190	0.0
OCDD	0.001	140	1.4
2,3,7,8-TCDF	0.100		
Other TCDF	0.000		
1,2,3,7,8-PeCDF	0.050		
2,3,4,7,8-PeCDF	0.500		
Other PeCDF	0.000		
2,3,7,8-HxCDF	0.100		
Other HxCDF	0.000		
2,3,7,8-HpCDF	0.010		
Other HpCDF	0.000	~~190~~ 2700	0.0
OCDF	0.001	58	0.058

Total Toxic Equivalent 1.2

Reference: "Interim Procedure for Estimating Risk Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans (CDDs and CDFs)" EPA/625/3-89/016.

X. TOXIC EQUIVALENT FACTOR (TEF) 6684A-3 : 12903

Were samples with a TEF > 0.7ug/Kg for soil/sediment or fly ash; 7.0ug/Kg for chemical waste and 0.007ug/L for aqueous samples confirmed on SP-2300, SP-2331 or equivalent column?

Were EMPC values were included in the TEF calculations?

Yes [ ] No [ ]

Check that the TEF values were calculated including EMPCs using the following guidelines:

Compound	Multiplying Factor	Concentration	Toxic Equivalent
2,3,7,8-TCDD	1.00		
Other TCDD	0.00		
2,3,7,8-PeCDD	0.50	9.0	4.5
Other PeCDD	0.00		
2,3,7,8-HxCDDs	0.10		
Other HxCDD	0.00		
2,3,7,8-HpCDD	0.01	56	.56
Other HpCDD	0.00	~~630~~	0.63
OCDD	0.001	630	
2,3,7,8-TCDF	0.100	240 (R)	24
Other TCDF	0.000		
1,2,3,7,8-PeCDF	0.050	4.9	0.24
2,3,4,7,8-PeCDF	0.500	46	23
Other PeCDF	0.000		
2,3,7,8-HxCDF	0.100	24, 7.3, 7.1	3.8
Other HxCDF	0.000		
2,3,7,8-HpCDF	0.010		
Other HpCDF	0.000		
OCDF	0.001	39	0.039
	Total Toxic Equivalent		53, 29

Reference: "Interim Procedure for Estimating Risk Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans (CDDs and CDFs)" EPA/625/3-89/016.

6684A-3D/12904

X. TOXIC EQUIVALENT FACTOR (TEF)

Were samples with a TEF > 0.7ug/Kg for soil/sediment or fly ash; 7.0ug/Kg for chemical waste and 0.007ug/L for aqueous samples confirmed on SP-2300, SP-2331 or equivalent column?

Were EMPC values were included in the TEF calculations?

Yes [✓] No [ ]

Check that the TEF values were calculated including EMPCs using the following guidelines:

Compound	Multiplying Factor	Concentration	Toxic Equivalent
2,3,7,8-TCDD	1.00		
Other TCDD	0.00		
1,2,3,7,8-PeCDD	0.50	6.9	3.5
Other PeCDD	0.00		
2,3,7,8-HxCDDs	0.10	45	4.5
Other HxCDD	0.00		
2,3,7,8-HpCDD	0.01		
Other HpCDD	0.00		
OCDD	0.001	470	0.47
2,3,7,8-TCDF	0.100	210*	21
Other TCDF	0.000		
1,2,3,7,8-PeCDF	0.050	4.7	0.24
2,3,4,7,8-PeCDF	0.500	38	19
Other PeCDF	0.000		
2,3,7,8-HxCDF	0.100		
Other HxCDF	0.000		
2,3,7,8-HpCDF	0.010		
Other HpCDF	0.000		
OCDF	0.001	22	0.022
	Total Toxic Equivalent		49*

Reference: "Interim Procedure for Estimating Risk Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans (CDDs and CDFs)" EPA/625/3-89/016.

X. TOXIC EQUIVALENT FACTOR (TEF) 6684A:12907

Were samples with a TEF > 0.7ug/Kg for soil/sediment or fly ash; 7.0ug/Kg for chemical waste and 0.007ug/L for aqueous samples confirmed on SP-2300, SP-2331 or equivalent column?

Were EMPC values were included in the TEF calculations?

Yes [ ] No [ ]

Check that the TEF values were calculated including EMPCs using the following guidelines:

Compound	Multiplying Factor	Concentration	Toxic Equivalent
2,3,7,8-TCDD	1.00		
Other TCDD	0.00		
2,3,7,8-PeCDD	0.50		
Other PeCDD	0.00		
2,3,7,8-HxCDDs	0.10		
Other HxCDD	0.00		
2,3,7,8-HpCDD	0.01		
Other HpCDD	0.00		
OCDD	0.001	84	0.084
2,3,7,8-TCDF	0.100		
Other TCDF	0.000		
1,2,3,7,8-PeCDF	0.050		
2,3,4,7,8-PeCDF	0.500		
Other PeCDF	0.000		
2,3,7,8-HxCDF	0.100		
Other HxCDF	0.000		
2,3,7,8-HpCDF	0.010		
Other HpCDF	0.000		
OCDF	0.001		
	Total Toxic Equivalent		0.084

Reference: "Interim Procedure for Estimating Risk Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans (CDDs and CDFs)" EPA/625/3-89/016.

X. TOXIC EQUIVALENT FACTOR (TEF) 6684A | 6684A-1

Were samples with a TEF > 0.7ug/Kg for soil/sediment or fly ash; 7.0ug/Kg for chemical waste and 0.007ug/L for aqueous samples confirmed on SP-2300, SP-2331 or equivalent column?

Were EMPC values were included in the TEF calculations?

Yes [ ] No [ ]

Check that the TEF values were calculated including EMPCs using the following guidelines:

Compound	Multiplying Factor		Concentration	Toxic Equivalent
2,3,7,8-TCDD	1.00			
Other TCDD	0.00			
2,3,7,8-PeCDD	0.50			
Other PeCDD	0.00			
2,3,7,8-HxCDDs	0.10	~~3.5~~	~~.35~~	
Other HxCDD	0.00			
2,3,7,8-HpCDD	0.01	3.5	0.035	
Other HpCDD	0.00			
OCDD	0.001	81	0.081	
2,3,7,8-TCDF	0.100			
Other TCDF	0.000			
1,2,3,7,8-PeCDF	0.050			
2,3,4,7,8-PeCDF	0.500			
Other PeCDF	0.000			
2,3,7,8-HxCDF	0.100			
Other HxCDF	0.000			
2,3,7,8-HpCDF	0.010			
Other HpCDF	0.000			
OCDF	0.001	10	0.01	
		Total Toxic Equivalent		~~0.44~~ 0.13

Reference: "Interim Procedure for Estimating Risk Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans (CDDs and CDFs)" EPA/625/3-89/016.

6684H-5: 1291C

X. TOXIC EQUIVALENT FACTOR (TEF)

Were samples with a TEF > 0.7ug/Kg for soil/sediment or fly ash; 7.0ug/Kg for chemical waste and 0.007ug/L for aqueous samples confirmed on SP-2300, SP-2331 or equivalent column?

Were EMPC values were included in the TEF calculations?

Yes [✓] No [ ]

Check that the TEF values were calculated including EMPCs using the following guidelines:

Compound	Multiplying Factor	Concentration	Toxic Equivalent
2,3,7,8-TCDD	1.00		
Other TCDD	0.00		
2,3,7,8-PeCDD	0.50		
Other PeCDD	0.00		
2,3,7,8-HxCDDs	0.10		
Other HxCDD	0.00		
2,3,7,8-HpCDD	0.01	26	0.26
Other HpCDD	0.00		
OCDD	0.001	350	.35
2,3,7,8-TCDF	0.100		
Other TCDF	0.000		
1,2,3,7,8-PeCDF	0.050		
2,3,4,7,8-PeCDF	0.500		
Other PeCDF	0.000		
2,3,7,8-HxCDF	0.100		
Other HxCDF	0.000		
2,3,7,8-HpCDF	0.010		
Other HpCDF	0.000		
OCDF	0.001		
	Total Toxic Equivalent		0.61

Reference: "Interim Procedure for Estimating Risk Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans (CDDs and CDFs)" EPA/625/3-89/016.

X. TOXIC EQUIVALENT FACTOR (TEF)

Were samples with a TEF > 0.7ug/Kg for soil/sediment or fly ash; 7.0ug/Kg for chemical waste and 0.007ug/L for aqueous samples confirmed on SP-2300, SP-2331 or equivalent column?

Were EMPC values were included in the TEF calculations?

Yes [✓] No [ ]

Check that the TEF values were calculated including EMPCs using the following guidelines:

Compound	Multiplying Factor	Concentration	Toxic Equivalent
2,3,7,8-TCDD	1.00		
Other TCDD	0.00		
2,3,7,8-PeCDD	0.50		
Other PeCDD	0.00		
2,3,7,8-HxCDDs	0.10		
Other HxCDD	0.00		
2,3,7,8-HpCDD	0.01	21	0.21
Other HpCDD	0.00		
OCDD	0.001	320	0.32
2,3,7,8-TCDF	0.100		
Other TCDF	0.000		
1,2,3,7,8-PeCDF	0.050		
2,3,4,7,8-PeCDF	0.500		
Other PeCDF	0.000		
2,3,7,8-HxCDF	0.100		
Other HxCDF	0.000		
2,3,7,8-HpCDF	0.010		
Other HpCDF	0.000		
OCDF	0.001	17	0.017
	Total Toxic Equivalent		0.55

Reference: "Interim Procedure for Estimating Risk Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans (CDDs and CDFs)" EPA/625/3-89/016.

X. TOXIC EQUIVALENT FACTOR (TEF) 6684A-6/12914

Were samples with a TEF > 0.7ug/Kg for soil/sediment or fly ash; 7.0ug/Kg for chemical waste and 0.007ug/L for aqueous samples confirmed on SP-2300, SP-2331 or equivalent column?

Were EMPC values were included in the TEF calculations?

Yes [✓] No [ ]

Check that the TEF values were calculated including EMPCs using the following guidelines:

Compound	Multiplying Factor	Concentration	Toxic Equivalent
2,3,7,8-TCDD	1.00		
Other TCDD	0.00		
2,3,7,8-PeCDD	0.50		
Other PeCDD	0.00		
2,3,7,8-HxCDDs	0.10		
Other HxCDD	0.00		
2,3,7,8-HpCDD	0.01	42	0.42
Other HpCDD	0.00	200	0.20
OCDD	0.001	~~88~~	~~0.023~~
2,3,7,8-TCDF	0.100	23	2.3
Other TCDF	0.000		
1,2,3,7,8-PeCDF	0.050	21	~~1.14~~ 1.1
2,3,4,7,8-PeCDF	0.500	15	7.5
Other PeCDF	0.000		
2,3,7,8-HxCDF	0.100	66, 21	8.7
Other HxCDF	0.000		
2,3,7,8-HpCDF	0.010	100, 28	1.28
Other HpCDF	0.000		
OCDF	0.001	190	0.190
Total Toxic Equivalent			~~19~~ 22 PE/L

Reference: "Interim Procedure for Estimating Risk Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans (CDDs and CDFs)" EPA/625/3-89/016.

wt 20.79g

9145125P02-02

XI SAMPLE CALCULATION: RRF 0.87 TCDD Qis = 2000 pg

Conc 2,3,7,8-TCDD = $2000\,pg\,(21443\,6520)/0.02079\,kg\,(14697787)\,0.87 \times \frac{1\,mg}{10^6\,pg}$

TCDF

EDL = $\frac{2.5 \times 2000\,pg\,[(0.20-0.05))\,9.5\times10^3 + (.19-0.06)(10^4)]\,B}{(6.76\times10^5 + 9.27\times10^5 \times 0.95 \times 20.79)} = 0.43\,ppt = 1.61\,ng/kg$

EMPC = 1,2,3,4,6,7,8-HpCDF = $\frac{(1.05\times10^8 + 1.0\times10^8) \times 2100\,pg}{(1.52\times10^6 + 3.43\times10^6)(1.57)(20.79g)} = 2700\,pg/g$

$$\text{Concentration (ng/g)} = \frac{Qis \times (Ax^1+Ax^2)}{(W \text{ or } V) \times (Ais^1+ais^2) \times RRFx \times D}$$

$$EDL = \frac{2.5 \times Qis \times (Hx^1+Hx^2) \times D}{(W \text{ or } V) \times (His^1+His^2) \times RRFx}$$

$$EMPC = \frac{Qis \times (Ax^1+Ax^2) \times D}{W \text{ or } V \times (Ais^1+Ais^2) \times RRFx}$$

where:

Qis = quantity (ng) of appropriate internal standard added to sample before extraction

Ax^1 and Ax^2 = integrated areas of the two quantitation ions

W and V = weight (g) or volume (L) of sample extracted

RRFx = calculated relative response factor from the continuing calibration

Hx^1+Hx^2 = peak heights of the noise for the quantitation ions

His^1+His^2 = peak heights of the internal standard quantitation ions

D = dilution

XB-9202- Originator

Lockheed Engineering & Sciences Company

198 Crosby Drive
Bedford, MA 01730

PHONE CONVERSATION RECORD

Date 2 / 3 / 92

Time 1110 AM/PM (PM circled)

Conversation with:

Name Jeff Sprenger

Company Keystone

Address Oregon

Phone 503-624-2773

✓ Originator Placed Call
__ Originator Received Call

W.O. NO. ____

Subject ____

Notes: Jeff Sprenger - requested a copys. DC-2 forms - he told me all other information would be sent out today.

Response: I faxed out DC-2 forms to Jeff Sprenger

Response: All requested information was received by Fed X on Feb 5 1992

__ File ____
__ Follow-Up By: ____
__ Copy/Route To: ____

Follow-Up-Action: ____

Originator's Initials

Lockheed
Engineering & Sciences Company

→ B-92-01-44
Originator

198 Crosby Drive
Bedford, MA 01730

PHONE CONVERSATION RECORD

Conversation with:

Name Jeff Sprenger

Company Keystone

Address Oregon

Phone 503 - 624 - 2773

Date 1 / 28 / 92

Time 12:10 AM/PM

__ Originator Placed Call
✓ Originator Received Call

W.O. NO. _____

Subject _____

Notes: Jeff. Sprenger returned my call & he said he would try to get all the required Info to me on Monday the 3 1992,

✓ File _____
__ Follow-Up By: _____
__ Copy/Route To: _____

Follow-Up-Action: _____

_____
Originator's Initials